Geophysical Research Abstracts
Vol. 12, EGU2010-8541, 2010
EGU General Assembly 2010

Transition of deep convective clouds to cirrus clouds in a GCM using Lagrangian trajectory analysis

Swati Gehlot and Johannes Quaas
MPI-Hamburg, Atmosphere in Earth System, Hamburg, Germany (swati.gehlot@zmaw.de)

Clouds are one of the most important components of the climate system, regulating the radiation budget of the earth. In the simulation of the global climate using General Circulation Models (GCMs), cloud feedbacks contribute to a major uncertainty on account of poorly represented cloud processes in the model. In particular, the representation of convection and convective clouds constitutes at the same time a crucial component of GCMs and a main source of uncertainty. Satellite observations provide the most comprehensive view of cloud related quantities at a global scale, and are an important data source for the evaluation of parameterization schemes.

The International Satellite Cloud Climatology Project (ISCCP) simulator is a valuable tool for analysis of a GCM output related to clouds. In this work we present the diagnostic applications of the ISCCP simulator to pin point cloud feedback mechanisms in ECHAM5 GCM, related to deep convection. A subgrid-scale cloud generator based on the approach suggested by Räisänen et al (J. Clim., 2007) is implemented in the ECHAM5 model and this improved version of ISCCP simulator is used for study of convective cloud transition.

Cirrus cloud (anvil cirrus + cirrostratus) formation following a deep convective event within the ECHAM5 model and ISCCP observations is analysed using the Lagrangian forward trajectories. Following the method based on Luo and Rossow (J. Clim., 2004), we use 3 hourly model and ISCCP data to create winter and summer month trajectories for the year 2004. The forward trajectories for the model output are created by the model wind fields at a pressure of 300 to 500 Hpa. Similarly, the ERA40 reanalysis wind fields are used in determining the trajectories for the ISCCP observations. ISCCP histograms of the model and observations are compared for tracking the cirrus life cycle associated with deep convective events in 5 day period. The analysis also includes a separation of cirrus clouds formed due to convection and the ones formed in-situ due to large scale dynamics.